The Scientific Review,

AND

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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

November 20th to December 31st inclusive.

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Velocipedes, Bicycles, &c.—W. H. Thompeon, J. C. Garrood, J. R. Starling, A. Kirby, L. A. Lamplough, J. S. Cooke, J. Steele, J. Hillman, J. Harrington, J. H. Walsh, J. T. Townsend, W. Andrews, J. Starling.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials,—C, Piper (com.), A. G. Collings and F. Bryant, W. Fox and G. Brown, J. Mitchell (com.) J. Summerscales, H. A. Andrew and W. Lockwod.

Water-Pgwer Engines.—W. F. Thompsou (ccm.)

Wearing Apparel, &c.—C. Hayes, A. M. Clark (com.)

Window Blinds und Sashes.—N. J. Phillips, A. C. Farrington, A. Forbes, R. Waller, C. F. Elliott, H. Fletcher.

⁂ *The above List is prepared from the Paten Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Reviews.

PARASITIC SAVANS.

The Gossiping Tongue, and other Salutary Satires. By the Rev. Prof. GEORGE BUTLER BRADSHAW. London: A. Bachhoffner, 162, High Street, Clapham.

READERS of the *Scientific Review* are not altogether unacquainted with the fact that instances have been discovered in which gentlemen using the same indications of University training or connection with learned societies—the well-known suffixed initials—really have possessed one of the qualifications (though in their case they possessed this one only) which enabled such men as Newton, Tyndall, and Rankine to attach the honourable brand of learning to their names—they paid the entrance fees. As these parasitic savans always afford a good fund of amusement and instruction when their mode of advancement is explained, the Rev. Prof. Bradshaw's present volume of poetical satires will be generally acceptable. As elegant little poems they are well worth reading, whilst the satire is just what it should be; it can offend no one, and if some may find it "—keen, wound with a touch that's scarcely felt or seen," so much the better: they may be thereby induced to resume their real place in society and to cease to bring ridicule upon themselves and the titles they usurp.

The poems are dedicated alike to hypocritically professed "saints," and honestly avowed sinners; which classes are quite large enough to include parasitic savans of every description. No one, however, as the Reverend Professor remarks, need wear any of the numerous satirical caps supplied in his pages, unless convinced that they *fit* quite as well as if they had all been made *to order* after the most exact measurement; but those who found them so are heartily welcome to don the new head-dress, which it is hoped will prove immediately profitable even if at first a little uncomfortable to some of the wearers. Ere long, perhaps, both their heads and their hearts will require an entirely different and much more agreeable attire.

The whole of the poems are evidently written with a view to do good by exposing humbug and hypocrisy, and more than one will probably remark that the number of the poems—thirteen—is the old woman's proverbially unlucky number; and unlucky many will find it, for the thirteenth poem—Sham Degrees; or Jackdaws in Dove's Feathers—will do more to expose the character of the parasitic savans by which the scientific and literary world is now almost sapped to exhaustion than could be hoped to be done by any quantity of prose writing or systematic discussion, since the poetic satire will be understood by all, whilst the more direct remedy would take effect only on those to whom it could be personally applied. It may be hoped that to some the satire will at least be a warning not to do,

> "As those counterfeit scholars have done who write after
> Their names learned *Letters*, exciting the laughter
> Of all men who know that those shameless pretenders
> Have brought them from sham Universities' vendors.
>
> . . . . . .
>
> "As to '*Masters of Arts*,' we've M.A's' so abundant
> That the dunces themselves might well deem them redundant,
> But a still greater host flourish 'Doctors'' Degrees—
> D.C.L.'s—LL.D.'s—Ph.D.'s—and D.D.'s.
>
> . . . .
>
> But though there's great danger, the public abuse
> We have here flagellated may greatly reduce
> The high Academical value of true
> And all honestly earned, Degrees, and imbue
> Those who've won them by long meritorious labours
> With contempt for such honors, in fear that their neighbours
> Might think their true gold was base metal—that gold
> Is *enhanced* by each counterfeit which they behold;
> For their metal would ne'er have been worth imitation,
> By the *pinchbeck*, if it had not high valuation.

These few lines will suffice to show the kind though cruel manner in which the Reverend Professor handles those who come under him for punishment. The volume is in every respect enjoyable to those who are not whipped, but if all whom anyone of the caps fit purchase a copy, the author will speedily become a millionaire.

HARCOURT AND MADAN'S PRACTICAL CHEMISTRY.

"Exercises in Practical Chemistry," Vol. I. Elementary Exercises. By A. G. VERNON HARCOURT, M.A., F.R.S., Sec. C.S., and H. G. MADAN, F.C.S. Third Edition, Revised by H. G. MADAN, M.A., F.C.S. Oxford: Clarendon Press, 1880.

THIS as will be seen is the first volume of the third edition of a well-known text-book. The present edition will be found in no way below the standard of the previous ones, though the Editor has to regret the loss of the co-operation of Mr. Harcourt.

The chief alterations in the present edition are:—

"1. The succession of the Exercises has been to a certain extent re-arranged, so as to make them follow more nearly in the order in which a beginner would probably study the radicles in the course of his reading.

"2. A few additional Exercises, such as those on Weighing and Measuring, and on Chemical Action, and a rather large number of additional experiments have been introduced; such experiments alone being selected as can be made without much risk, and with the simplest apparatus."

"3. Short headings have been placed before most of the experiments, in order that the student may appreciate more clearly what the experiment is intended to illustrate, before he performs it."

We cordially recommend this work to students and others who delight in the study of chemistry, who will no doubt find it of great value.

REYNOLDS' EXPERIMENTAL CHEMISTRY.

"Experimental Chemistry for Junior Students." By J. EMERSON REYNOLDS, M.D,, F.R.S., Professor of Chemistry, University of Dublin. Part I., Introductory. London: Longman, Green, and Co. 1881.

OF chemical works there have been so many both for junior and senior students, that it would be difficult to make a choice of the work one should read.

This little work, which forms the first part, the complete work occupying four parts, the author informs us is identical in plan with his "Six Lectures on Experimental Chemistry," but different in style, and much extended in range, so as to include the amount of knowledge of fact and principle usually expected from junior Arts Medical and Pharmaceutical Students, as well as from the higher classes in Intermediate Schools.

The system pursued in this book is designed to lead the student through a series of connected experiments—often *quantitative* in form—and to assist him in the interpretation of his results, and in devising modes of testing the validity of the conclusions drawn from them. Thus, while acquiring a tolerably wide knowledge of fact, the student receives a certain amount of training in the purely "experimental method" of investigating Nature.

UNIVERSAL INSTRUCTOR.

"Universal Instructor; or Self Culture for All." London: Ward, Lock, and Co.

WE have received Parts 1, 2, and 3 of this new serial. That the requirements for self-culture have been by previous serials fully allowed by the success of such works as the "Popular Educator" is patent to all. The only question is whether too many works on the plan of the one under consideration might not be a disadvantage. We think not, and we have no hesitation in recommending the work, which is to be completed in 36 monthly parts. The publishers give plenty for the sixpence, which is the price of each part.

THE FOG QUESTION.

A NEW phase of what is called "Sanitary Reform" has just been brought forward. We have been told that the fogs of London and of our other large cities are a nuisance, and though the news is somewhat of the stalest we are listening as to some novel revelation and beginning to look out for a remedy. Here, therefore, arises a danger lest in our well-meant endeavours to get rid of fog we bring down upon ourselves even greater evils.

The favourite proposal at present is "smoke-consumption," as it is called. It is suggested that "if local authorities had the power to levy a tax on every fireplace so constructed as not to consume its own smoke, the smoke nuisance would disappear in a very few years." Now we do not for a moment dispute that the normal city fog, yellow or black in its colour, owes most of its disagreeable attributes to the products of the combustion of coal. But will smoke-consumption free us from all these evils? The irritating effects of a dry fog upon the eyes and the mucous membrane of the nose, &c., is admittedly due to the evolution of sulphurous acid derived from the oxidation of the sulphur present in all coal. No smoke-consumption can free us from this gas. On the contrary, the more complete every particle of coal is burnt the more certain we are that all its sulphur will be converted into sulphurous or sulphuric acid. We have known manufacturing establishments where nothing but colourless transparent vapour escaped from the chimneys, but the condition of vegetation in the neighbourhood, and the acid reaction of water in which the leaves of adjacent trees had been steeped, showed but too plainly that the enemy was not less formidable because no longer perceptible. So long as we burn the same quantity of coal within the metropolitan area, so long, in calm and cold weather, we shall have a suffocating atmosphere. The only true remedy for this evil is to obtain from coal its practical maximum of duty, and thus immensly to decrease its consumption. Now it is exceedingly doubtful whether any kind of firegrate or stove exists which will answer both these purposes combined. To minimise the quantity of coal needed to heat our houses, the German or Dutch fire-clay stove, with its winding flues which enable the combustion gases to expend almost their entire heat before entering the chimney, are probably the best contrivances known. We are glad to find that Dr. Alfred Carpenter, in his paper read before the Society of Arts, urges that fire-clay would supersede in all possible parts of a firegrate. But though these stoves greatly decrease the consumption of coal, they are not necessarily smoke-consuming, and might very possibly not be accepted by the smoke inspectors who in due time are to lord it over our homes and hearths. On the other hand, many smoke-consuming appliances which we have seen assuredly do little towards diminishing the quantity of fuel required, and the consequent amount of sulphurous acid given off. A charge brought by Dr. Carpenter against coal-smoke is the following:—"It is a main factor in the production of a high rate of mortality arising from the absence of ozone, or of ozonized hydrogen, or depreciation of oxygen capable of acting upon changing organic matter." That the absence of ozone involves a high rate of mortality is an unproved assertion, nearly all the observations that have been made on the subject being inconclusive. Moreover, it can be experimentally proved that ozone irritates the organs of respiration, the very parts chiefly attracted by our town fogs. Statistics do not warrant the inference that "zymotic" disease is promoted by coal-smoke. It is even probable that containing as it does coal-tar products and traces of carbolic and cresylic acids it may act as a disinfectant.

There seems to us an obvious difference between dwelling-houses and factories which ought to be considered before applying the Smoke Prevention act to the former. A factory, if not the freehold of the occupant, is generally held under a long lease. Hence the occupier may with obvious fairness be called upon to undertake such structural alterations as the public good seems to require. But in a dwelling-house the tenant has in a large majority of cases no permanent interest. It is scarcely compatible with justice to compel a man either to submit to a tax which is in reality a penalty or to sink perhaps more than a year's rent in altering the fire-grates of a house which he may have to quit at six months' notice, and perhaps to repeat the outlay at another dwelling! Then there is the pleasant prospect that the inspector may be induced by dealers in stoves to pronounce the arrangements for smoke-consumption unsatisfactory, and the expense and the trouble will have to be incurred afersh! In prospect of such things we believe that all save the wealthy will prefer to run the risk of bronchitis rather than the certainty of being harried for the carrying out of this new sanitary reform.

There is one cause of smoke and general nuisance which has sprung up of late in all the outskirts of London which have a clay sub-soil, namely, "ballast" burning. This is carried on in the northern suburbs in the most high-handed manner and quite close to dwelling houses. A ballast heap gives off more smoke than a hundred dwelling-houses. Such smoke, too, is far worse in quality. The poorest coal mixed with the contents of the dust bins serve for fuel, and as the heat is never fierce, the volatile products are not decomposed but escape into the atmosphere. In certain states of the weather, a plot of land of hundreds of square yards may be seen completely shrouded by the smoke and vapours of a single heap. This nuisance should be the first evil to be suppressed in the endeavour to improve the atmosphere of London. Next, sharper attention should be paid to locomotives, steamships on the river, and the portable engines used by building speculators and others, many of which dispense clouds of black smoke without any interference. It might be fairly enacted that all houses built after a certain date should be fitted with some improved fire-grate, and that other houses on the expiration of a tenancy should be reformed before being let again. Now the appliances for the use of gas as a fuel have been so greatly improved by certain inventors, among whom Mr. Fletcher, of Warrington, may claim the foremost place, it is very certain that cooking by gas would increase greatly if the price were reduced. It strikes us that the gas companies would find in this respect liberality the best policy, since lower charges would lead to a vastly increased consumption.—*Chemical News.*

NEW MINERAL DISCOVERIES.

From the proceedings of the Academy of Natural Sciences of Philadelphia, just published, we extract the following concerning the mineral deposits recently discovered:

A New Locality for Amethyst.—Mr. W. W. Jefferis announced that amethysts, well crystallized, and of a rich purple colour, had been found this spring, for the first time, in the northern part of Newlin Township, Chester county, Pa. They were brought to the surface by deep ploughing, and were supposed to be derived from a vein of this mineral.

A New Corundum Locality.—Mr. W. W. Jefferis remarked that a vein of blue corundum, similar to that found in North Carolina, was struck, on the south side of the Serpentine ridge, in Newlin Township, Chester county, Pa., a short time since. The vein is well defined, between walls of culsageeite, in large plates of a yellowish-green colour. Over 500 pounds of massive blue corundum have been taken out within ten feet of the surface.

Minerals in North Carolina.—Mr. H. C. Lewis communicated the following list of minerals which he had found near Dobson, Surry county, N. C., during a recent visit to that locality:

Native sulphur, galena, pyrrhotite, pyrite, chalcopyrite, hematite, menaccanite, magnetite, limonite, hausmannite, psilomelane, wad, hornblende, actinolite, asbestos, garnet, talc, steatite, ripidolite, chlorite.

The psilomelane occurred in a bed about 18 feet in thickness.

The magnetite was frequently polar. Native sulphur occurred in cavities in quartzite as a coarse loose powder of rounded wax-like grains, and was the result of the decomposition of pyrite.

It was also stated that rutile occurred in Alexander county, N. C., a new locality.

Fossil (?) Casts in Sandstone.—Dr. J. M. Cardeza exhibited specimens of quartz sandstone (Potsdam ?) which he had found lying loose upon the soil at Duttan's Mills, Pa., in which were oblong rounded casts of sandstone, about an inch in length, and similar to one another in shape. It was questioned whether they might not be fossils.

An Inclosure in Quartz.—Mr. H. C. Lewis exhibited a crystal of quartz from Herkimer county, N. Y., in which, hanging from a bubble which moved in a cavity containing liquid, was a tuft of minute acicular crystals of a pure white colour. A microscopical examination had failed to identify them with any known substance. The crystals were similar to those of many organic salts. It was conjectured that they had crystallized out from the liquid. Under a power of 75 they looked like tufts of white wool, and it was suggested that if future investigation failed to refer them to a known mineral species, it might be convenient to give them the name *Erilite* (from Gr. *erion*, wool).

In other cavities in the same crystal there was an amorphous yellowish-brown waxy substance of unknown composition.

Menaccanite and Talc from Maryland.—Mr. Wm. W. Jefferis remarked that in Harford county, Md,, near the village of Dublin, there is a vein of green foliated *talc* in the serpentine, which has been opened about 6 feet in length. It has furnished cleavage foliated specimens over a foot in extent. The same vein contains *menaccanite* in tubular crystals, well crystallized. Yellow beryl has also been found there, showing all three in the same specimen.

Sunstone in Labradorite.—Mr. Jefferis stated that on examining a specimen of labradorite in his possession, from the coast of Labrador, he found that in addition to the usual play of colours (blue and green), by turning it in another direction it showed innumerable crystals of gothite, making it a beautiful sunstone, which, he believed, was an unusual thing, and which he had not found mentioned in the books.

RECENT HISTORY OF ELECTRIC LIGHTING.

By Henry Morton,
President of Stevens Institute of Technology.

On the 17th of October, 1878, in fulfilment of a promise made a year before, the present writer read before the American Association of Gas Engineers an address in which (alluding to the reports then resounding in the daily papers as to Mr. Edison's new form of electric lamp) he said, after quoting an account of a similar report current twenty years before in France:—"These promising experiments, as we all know, reached no successful results. I would by no means, however, have it inferred that better success can never be attained. On the contrary, there are several very promising directions for experiment, on one of which no doubt Mr. Edison is at present embarked; but the difference between a promising line of experiment and a successful result, as all the world's history teaches us, is often a distance of many years, to say the least." An opinion so little calculated as this, to aid in "bearing" gas stocks, naturally excited no little disgust in certain quarters, and I had the pleasure of seeing myself very handsomely abused by those whose approval would have been a very doubtful compliment.

Looking back over the space of two years which has elapsed since those words were uttered, and remembering the events which have transpired in this connection, I feel that I have much more reason to congratulate myself than have those who took an opposite view.

Not only has "the promising line of experiment on which Mr. Edison was then engaged been separated by many years from a successful result," but it has, within this time, been totally abandoned by him for another, which other is, to say the least, still under approval, and the discredit and ridicule which has been cast from all sides has shown how unfortunate and unwise were the reckless and unfounded assertions of the would-be Prophets of the Press.

Notwithstanding these drawbacks, however, continual progress has been made in the development of the art of lighting by electricity, and we have to regret that what would otherwise have been a dignified march of advancing science, reflecting nothing but credit upon this country and its inventors, has been degraded to some extent into a carnival route of grotesque and absurd extravagances.

In recording the progress which has been made in the art of electric lighting, the most important practical results have been achieved by those who have devoted their attention to the application of the electric arc. The great difficulty which presented itself two years ago in this subject was the unsteadiness of the light, its great liability to extinction, and the actual cost of maintaining it. By improvements in the carbon rods as to their purity of composition and uniformity of structure, a great increase in steadiness has been attained, and by other improvements in the mechanical arrangements of the self-adjusting lamps, this amelioration has been likewise assisted.

Among those who have done most for the improvement of the carbon rods, I would mention Wallace and Sons, of Ansonia, and among the most marked improvements in electric lamps I would cite those of the Brush Co., of Cleveland.

The economical efficiency of the electric generators or dynamo-electric machines has also been increased, and in this regard the best results, so far as accurate tests which have been published indicate, have been obtained by Mr. Edison, whose machine, as tested by Profs. Young and Bracket, shows the very high efficiency of 81·4 per cent. of motive force of energy converted into electric current. The machines of other inventors appear to be only a few per cent behind this, if indeed some of them are not found to equal it when accurately measured.

In consequence of these improvements and of the energy with which the several manufacturers have brought these machines to the notice of those likely to use them, their employment in factories, stores, workshops, and hotels has become very general, and has undoubtedly proved of great advantage and convenience, although instances are not wanting (as, for example, in the great cotton mills at Lowell, Mass.), where the electric lighting was abandoned after a thorough test. There is, however, so wide a field in which this light has manifest advantages over any other means of illumination that we may confidently look for a vast increase in its introduction in all parts of the country.

Turning next to the production of light by incandescence we find that this branch of the art also has made marked advances. This art had its beginning as early as 1845, when in the patents taken out in England by King, the representative of the American, Mr. Starr, we find described the use of platinum wires and thin rods of carbon, the latter inclosed in a torricellian, or absolute, vacuum. Extensive experiments in the same line were made by Mr. Moses G. Farmer, the widely known electrician, about the year 1858, and again a little later, by Dr. Isaac Adams, the inventor of the process of nickel plating, now widely used; but the costliness of an electric current derived from a galvanic battery prevented the earlier experiments from reaching any commercial success, and even with the cheap electricity of today, there is still a limit set upon this sort of lighting, by its relatively wasteful expenditure of electric force and consequent costliness.

Great progress has, however, been made here also.

Mr. Edison supposed he had solved the problem two years ago when he had re-invented the earlier methods of Starr, Farmer, and others, but very soon finding, as they had done, the insufficiency of his solution, he attacked the problem afresh with an energy, persistence, and originality of resources worthy of all praise. In the course of his researches he has brought to light a number of astonishing results, and has discovered whole classes of new properties in platinum, and other materials, and lime, magnesia, zirconia, and other substances.

Had his enthusiastic friends only claimed for him from time to time what he had actually done, his fame would have been unparalleled as a discoverer, and without blemish.

Unfortunately, too many prophecies have been indulged in, and the credit of really great achievements has been overshadowed by the failure of still greater assertions and promises.

After the abandonment of the platinum lamp, Edison next took up the carbon-in-vacuo lamp of Starr, and as before, his friends shouted "Eureka" at the beginning and not at the end of his search.

The carbon lamp, as first made by him, has met the fate of its predecessors, and has been abandoned by him likewise; but from its ashes have arisen, both in his and other hands, improved descendants, which show much better chance of survival.

Having found it impractically impossible to make his paper carbons sufficiently durable when heated to such an intensity as would render them even possibly economical as sources of light, he has ransacked nature for some material which would fill these hard conditions, and in a certain variety of bamboo has found something which he believes will yield him a fine hair-like thread of carbon with which he can obtain the light of 16 candles from a single lamp, at an expense of 3400 foot-pounds of energy a minute. This would represent about 9 such lamps, or about 155 candles per horse power.

This is a decided improvment in efficiency over his horse-shoe lamps of last year, and with a durability, as is claimed, of six months, will carry his system a long step forward on the roads toward success.

Starting, also, with the idea of Starr, as to the use of a strip of carbon in a vacuum, Mr. Maxim has proceeded along a different road.

In place of searching through nature for a substance which would yield a perfect lamp-carbon on heating, Mr. Maxim has sought to make a perfect carbon strip in his lamp by building it up on an imperfect form as a substratum. To accomplish this he has taken a strip of carbonised paper as his groundwork, and has plated this over with a metallic layer of graphitic carbon, by heating the original carbon strip by a current in an atmosphere of gasoline vapour. Under these circumstances, not only a sheet-like coating of this peculiar carbon deposited all over the strip, but, if there is a weak spot anywhere in it, the carbon will be first deposited at this point (on account of its getting hotter than the rest), and thus an irregular or defective carbon strip will be repaired and rendered perfectly uniform.

By this process two objects are obtained. In the first place a good carbon strip is secured, no matter what imperfections may have existed in the orginal paper or other carbon foundation. In the second place, the outer surface of the strip is composed of that variety of carbon whose resistance to heat and other mechanical injury surpasses all others. All familiar with the material will know, that what is technically called "gas carbon" (*i.e.*, the carbon deposited in the outlet retorts by the decomposition of the issuing gas), of gas is a metal-like substance, the cutting, the breaking, or shaping of which is very difficult, on account of its combined hardness and toughness. It very rapidly spoils the best steel files and saws, and to break it with a hammer is almost a hopeless undertaking.

I have also known a weighed quantity to be placed with the fuel in a cupola furnace where iron was being melted, and to have been taken out again after some hours not sensibly diminished in weight.

This is the material of which the surfaces of the carbon strips in the Maxim lamps are composed, and should they prove as enduring as is hoped, it is to this that we should naturally credit their resistance.

I have measured a number of these lamps with such results as the following:—

Lamp A.—Resistance cold 20·0 ohms, and when yielding in its best positions the light of 50 standard candles its resistance was 8·3 ohms. The current required to heat it to this degree was one of 4·07 webers, and the energy expanded was therefore about 5850 foot-pounds. This would represent about five and a half such lamps to each horse power of energy of current employed, or an efficiency of about 275 candles per horse-power. Taking 70 per cent of this as the average for all positions we would have about 192 candles per horse-power of current. Now the amount of actual horse-power in the steam engine required to develop one-horse power in the lamps will vary with the dynamo-electric machine, the number of lamps in use, and many other conditions, but we may assume 60 per cent as a safe allowance, and this would give us about 115 candles per actual horse-power from the engine as the efficiency of this lamp when run at 50 candles.

Another lamp (D) whose resistance cold was 115 ohms when yielding a light of 52 candles required a current of 1·35 webers, and had a resistance of 64 ohms when emitting the above-mentioned amount of light.

The electric energy consumed in this case was therefore about 5131 foot-pounds per minute, or about 6·4 such lamps to a horse-power, or at a rate of 330 candles per horse-power of current.

Taking 70 per cent as the average light in all directions, reduces this 231 candles, and assuming 60 per cent as the efficiency of the conversion from steam power into electric current into the lamp, brings it to 138 candles per horse-power of mechanical force developed in the steam engine.

We see therefore in this case also a marked advance upon the state of the art a year ago.

Undoubtedly the advance now made is sufficiently encouraging to authorise the experiments which are being made to apply these lights on a practical scale in locations where they have peculiar advantages, as, for example, in the vaults of the Safe Deposit Co., New York. When that experiment has been carried on for a few months, we shall knew much more than we do now as to the actual running cost of the system, but anything like a general adoption of the same in place of gas is still an affair of the future about which prediction is premature.—*Chemical News.*

RECENT AMERICAN AND FOREIGN INVENTIONS.

Mr. William W. Hopkins, of Thorntown, Ind., has patented an improved *wagon scale*, the object of which is to enable farmers to have a convenient set of farm scales for general use, and one adapted to weigh the contents of a wagon in bulk. It consists in the peculiar arrangement of a set of weighing levers fastened to the bottom of the wagon body, and adapted to bear against the bolster, in combination with a graduated scale beam, also carried by the wagon body.

Mr. Joseph Howard, of Bryan, Texas, has patented an improvement in *rolling hopper planters*, which consists in the construction and arrangement of the devices whereby the hopper is attached to the beams or frame of the machine.

Mr. Robert N. Boston, of Chestertown, Md., has patented an improvement in the class of machines adapted for simultaneously *dropping and covering corn and guano* or other fertilizer. The corn and guano are placed in separate hoppers, between which is a rotating wheel whose shaft or axis projects into the respective hoppers, and is provided with teeth that agitate and assist the discharge of the contents of the hoppers. The latter deliver corn and guano, respectively, into separate pockets or receptacles, from which they are taken up by cups affixed to the ends of radial arms projecting from and revolving with the aforesaid axis. The pockets and revolving arms are between the hoppers, and a seed spout is located in front of the pockets, so that the seed and fertilizer are delivered simultaneously into the same, and thereby mingled and conveyed into the furrow.

Mr. Joseph P. Prairie, of Raleigh, N. C., has patented a combined *cotton planter and guano distributer*, which is so constructed as to drop cotton seed and guano at the same time, in uniform quantities, and cover the seed and guano, and which can be adjusted to drop a larger or smaller quantity of either or both as required.

Mr. Isaiah A. Clippinger, of Plainfield, Ill., has patented an improved *spring for bed bottoms*, which will facilitate and cheapen their attachment to the supporting slats of the bed bottom and the attachment of the springs to each other, and effect continuity of the bearing surface.

An improvement in *dynamo-electric machines*, which Mr. Charles J. Van Depoele, of Detroit, Mich., has patented, consists in the peculiar construction of the revolving armature, and in the arrangement of the same in the magnetic field and the bearings carried by projections from the sides of the case.

The Scientific Review

AND

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SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1880—1881.

January 13th, Exposition of Inventions; January 27th, Patent Law Reform. Members' Meetings at 8 p.m. on Thursdays, February 10th and 24th; March 10th and 24th; April 7th and 28th; May 12th and 26th; and June 9th.

Annual General Meeting, Thursday, May 26th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

Dec. 9.—Meeting was held, when the resolutions embodied in our leader were carried.

Monthly Notices.

Mr. George F. Ansell, died on Tuesday, the 21st of December. He was born on March 4th, 1826, at Carshalton, in Surrey. He was apprenticed to a surgeon, and for four years studied medicine. At the end of that time he became a student of the Royal College of Chemistry, and was shortly after appointed assistant to Dr. Hoffman, and was with him associated in the Royal School of Mines. In 1854 Mr. Ansell was appointed Lecturer in Chemistry to the Panopticon; and to him the public are indebted for the celebrated illuminated fountain. In 1855 Mr. Ansell was appointed Assayer to the Mint under Prof. Graham. He made several large savings by his improvements in the works, and was the first to draw attention to the volatilization of gold. In 1866 Mr. Ansell's attention was drawn to some destructive explosions of fire-damp in collieries, and he visited and made a valuable series of experiments in Ince Hall Colliery and other mines. He had studied with Mr Thomas Graham the law of the diffusion of gases, and as a consequence he constructed in several forms his ingenious "Fire-damp Indicator." This instrument was most strongly recommended by Lord Kinnaird as president of the Accidents in Mines Commission, who brought the instrument under the notice of the House of Lords. This instrument has been largely used by the French engineers in their collieries, while it has been strangely neglected by our colliery viewers. Mr. Ansell wrote and published a work of much interest on "The Royal Mint," and he contributed to the seventh edition of Ure's "Dictionary of Arts, Manufactures, and Mines," edited by Robert Hunt, F.R.S., the articles on "Mint," "Fire-damp," and some others. Mr. Ansell was a good metallurgist; he patented a process for the purification of steel, and introduced several improvements in the art of working and refining gold and silver.

The Microscopic Structure of Rocks has of late received considerable attention. The first part of a series of beautifully executed photographs, selected and arranged by E. Cohen and executed by J. Grimm, have just been published at Stuttgart, under the title of "Sammlung von Mikrophotographien zur Veranschaulichung der Mikroskopischen Structur von Mineralien und Gesteinen" These are deserving of the closest study of all who are interested in the much-to-be-desired elucidation of this interesting subject.

The Monthly Record of the results of observations in meteorology and terrestrial magnetism at Melbourne for June, 1880, is to hand. The mean of the barometer for the month was 29·996; the mean temperature of air 508·4.

M. Dumas, in the *Journal de Pharmacie et de Chimie*, draws attention to the remarkable fact that the gases retained by occlusion in aluminium and in magnesium are differedt. The former metal occludes pure hydrogen; in the latter the hydrogen is always accompanied by carbonic acid and carbonic oxide.

M. Cauvet, in the *Bulletin* of the Botanical Society of France, describes his experiments made to determine the development of carbonic acid by the roots of plants. His result appears to show that roots constantly develope carbonic acid, but that the development is less by night than by day, and that it begins to increase with sunrise, that it decreases about noon, and rises again in the evening, to decrease at midnight.

The Electric Light in Buchanan Street, Glasgow.—The first application in Glasgow of electricity to street lighting in a permanent form took place last evening at the new *Herald* Buildings in Buchanan Street. The proprietors have also contracted with Messrs. Anderson and Munro, electric engineers, Glasgow, to light up the public offices and the composing rooms of the *Herald* and the *Evening Times* by electricity. The Gramme machines are those used, driven by an Otto gas engine, supplied by Messrs. P. Watt and Sons—gas thus curiously so far superseding itself. This gas engine also works the cyclic elevator in use during the day. The electric lamps are those invented by Mr. Brokie, formerly of Glasgow.

Safety Cheques.—Mr. A. A. Nesbit, F.C.S., has recently patented an invention which has for its object the prevention of forgery in connection with the alteration of cheques. The method which Mr. Nesbit proposes is, we believe, a step in the right direction, and will probably, if adopted, diminish to a considerable extent the chances of forgery. The invention consist in using paper coloured or stained with an acid or alkaline dye, which dye is sensible to the action of either acid or alkali. The paper so stained is printed with a colourless acid or alkaline ink, so that the effect produced is an acid or alkaline writing upon a ground coloured with a sensible dye having a different reaction; so that when an attempt is made to alter the printing the effect produced is that the difference between the colour of the printing and that of the ground is destroyed and the printed inscription rendered illegible.

A Novel Application of Parquet has just been made at the Marlborough Rooms, Regent Street, W., which are to be opened by His Royal Higness the Prince of Wales on the 3rd inst. Messrs. Eberhard and Co., of 8, Edward Street, Hampstead Road, London, are laying down parquet over the uneven surface of the stone flooring. The work is being accomplished by means of their patent glue without the slightest difficulty.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review

JANUARY, 1881.

GOVERNMENT AND THE TELEPHONE.

Patent Law Reform which we have for so many years strenuously advocated, has received during the past month a most important addition so far as regards the necessity of such reform being no longer delayed. Our readers are aware that the Government some years since took over the Telegraphs, and the money thus paid was naturally expected to be for the benefit of the public. To a certain extent no doubt this has been the case.

So far as telegraphy pure and simple is concerned, the Government have the monopoly. By the recent decision, however, it comes that the word *Telegraph* includes far more than we venture to say was ever premeditated at the time of the passing of Telegraph Acts, and without a reform in the Patent Laws it is hardly to be expected that inventors will bother themselves to benefit the Government. If they do they are likely to receive the scant courtesy that has been extended to the Telephone Companies.

To any practical mind the idea of sending messages by the Telephone was anticipated by the Government when the Telegraph Acts were past, is to say the least absurd. The long legal arguments which resulted in favour of the Government as against the Telephone Company, may be true and good in law, but is, we venture to think, against common sense. For if this dictum holds good, it is advisable if no other reform can be expected during the forthcoming Sessions of Parliament, that the clause which has been embodied in the Bills introduced in past Sessions, should be embodied in a short Bill so as to make the Government as liable as to private persons who may desire or wish to use a Patented Invention.

For it certainly could not be anticipated that by the Government buying up the rights of any particular industry they would practically discountenance improvements, which so far as the Telegraph is concerned has, we venture to say, been the case, for it is a fact patent to all who have had anything to do with the Government relative to inventions, that they *will* not see the great utility of inventions, but are perfectly wiling to adopt them and let the Inventor starve. This seems to be the case now.

When the Telegraphs were in the hands of the companies improvements were encouraged, now we find just the reverse, and further, the companies could afford to send local telegrams for just one half what the Government now charge for twenty words, and in the same ratio it would seem that by the Government taking the Telephone, we may look forward to their making a like increase. It is true the Government may be in their legal rights, but we think it very unwise on their part to stretch such right, which is, we venture to say, not only to the detriment of the nation at large, but to its position abroad; for it cannot be denied that if an inventor finds he cannot make it of service or profit to himself when secured by a Patent here, he certainly will not be induced to give his results if by this decision the Government under the elastic word Telegraph can stretch it to include the Telephone.

We presume, and it is to be hoped, that the Telephone Company will appeal against the decision, and not, as before Justice Stephens and Baron Pollock, leave it to simple argument alone, but have the witnesses who were ready and prepared to give evidence, and had filed affidavits against the view adopted by the Government, examined.

True they might not shake the dictum laid down; nevertheless we will have the evidence of some of the greatest scientific men of the day against the case as put forward by the Government. Looking at this decision broadly, it would seem to point a moral that where there is any great national industry which the Government wish to take over, it is, we would urge, far better for the interests of the nation at large that private enterprise is preferable to Government control. In some cases this may not apply, but as regards the Telegraphs it is held by this decision that the powers conveyed over to the Government were, as we said before, far more than was anticipated by the Act; for if the latest invention of Professor Bell, the Photophone, can be brought to a practical state, and be as serviceable to the public as the Telephone, then the Government will also have the free use of it.

Therefore we would strongly exhort inventors to be up and doing, so that the reform of Patent Law may be no longer delayed, and that the end of the present Session of Parliament may see its accomplishment.

At the last meeting of the Inventors' Institute, the following resolutions were passed :—

1. That a deputation and petition organizing committee be formed to carry out this object.
2. That in the opinion of this Council, Mr. Anderson's Patent Law Amendment Bill meets the required condition, viz., it is a short simple measure, entailing but little change in the Act of 1852, but obtains for that Act the efficient working intended by the framers of the Bill, by the appointment of paid Commissioners (who are at present conspicuous by their absence). the great reduction of fees, and extension of Patents to 21 years.
3. That it is desireable to have printed copies of petitions setting forth these points, circulated throughout the length and breadth of the land, for the purpose of obtaining signatures from all classes of Her Majesty's subjects, for presentation to Parliament.
4. That in order to meet the expense to be entailed by the foregoing, a Petition and Deputation Organizing Fund be opened, and that members of the Institute and others be asked to contribute thereto.

If the Government do not take the matter up this Session, all our energies should be devoted to secure the passing of Mr. Anderson's Bill which is to be again introduced this Session.

Proceedings of Societies.

ROYAL SOCIETY.

Nov. 18.—W. Spottiswoode, Esq., President, in the chair.—The following papers were read: "On the Essential Properties and Chemical Character of Beryllium," and "On the Molecular Heat and Volume of the Rare Earths and their Sulphates," by Messrs. L. F. Nilson and O. Pettersen. "On the Absorption Spectra of Cobalt Salts," by Dr. W. J. Russell, and "On the Friction of Water against Solid Surfaces of Different Degrees of Roughness," by Prof. W. C. Unwin.—Prof. G. Bell made experiments with his photophone, demonstrating the transmission of sound along a beam of light.

ANTHROPOLOGICAL INSTITUTE.

Nov. 9.—Dr. E. B. Tylor, President, in the chair.—A paper was read, "On Anthopological Colour Phenomena in Belgium and Elsewhere," by Dr. J. Beddoe. Within the last few years the numerical method had been extensively applied to the determination of ethnological colour-types, the Anthropometric Committee of the British Association having set the example. The continental nations were, however, now far ahead of us. In Germany Prof. Virchow had procured the tabulation as to the colour of the eyes and hair of all the school population, with the exception of Hamburg, which had proved Philistine in this matter as in so many other instances. In Switzerland Dr. Guillaume, of Neuchatel, had obtained school statistics. For Belgium an elaborate monograph had been written on the subject by Prof. Vander Kindere, who, by the aid of the National Geographical Society, had induced the Minister of Public Instruction to include questions on the colour of the children's eyes and hair in the education census. The results obtained have been of considerable importance, and bring out a remarkable contrast between the Flemish and Walloon provinces of Belgium. —Mr. J. F. Rowbotham read a paper, "On Different Stages in the Development of the Art of Music in Prehistoric Times." Musical instruments, though their varieties may be counted by hundreds, are yet readily reducible under three distinct types: 1. The drum type; 2. The pipe type: 3. The lyre type: and these three types are representative of three distinct stages of development through which prehistoric music passed. Moreover, the stages occur in the order named; that is to say, the first stage in the development of instrumental music was the drum stage, in which drums and drums alone were used by men; the second stage was the pipe stage, in which pipes as well as drums were used; the third stage was the lyre stage, in which stringed instruments were added to the stock. The three stages answer respectively to rhythm, melody, and harmony. And as in the geological history of the globe the chalk is never found below the oolite nor the oolite below the coal, so in the musical history of mankind is the lyre stage never found to precede the pipe stage, nor the pipe stage to precede the drum stage —A paper was read "On Neolithic Implements in Russia," by Prince P. Pontiatine. From the evidence of certain finds on his estate the author came to the conclusion: 1. That the Slav Scythians existed there in the stone period; 2. That they possessed instruments resembling those of the Celt Scythians and burned their dead; 3. That the old iron period of that neighbourhood was a continuation of the stone period; 4. That they supported themselves partly by hunting; 5. That they understood corn growing.

NEW SHAKSPERE.

Nov. 12.—J. N. Hetherington Esq., in the chair.—Dr. Nicholson read papers on five points in "Hen. V.," "On the Emendation of 'Guidon' for 'Guard: on 'in IV. ii. 61,' (strongly condemning the emendation); "On 'Qualtitie calmie custure me,' IV. iv. 4" (contending that the changes of the first two words to "Qualite calino" were necessary); "Did Pistol say, 'Doll' or 'Nell' in V. i. 74?" (contending that Pistol called his Nell "Doll" as a name of endearment); "On Quickly's 'a parted eu'n iust betweene Twelve and One, eu'n at the turning o' th' Tyde.' II. iii. 12, 13," contending that the tide was that of the Thames, and not that of the day, as Staunton suggested.—The former interpretation was supported by the Chairman, whose mother knew a case in which a man was very near dying, and a woman in the room sent for an almanac to see when the tide turned that day, and told the bystanders they need not be afraid, the sick man would not die till the tide turned. Mr. Furnivall read some "Notes by Mr. J. Spedding on Daniel's Introduction to the "Parallel Texts" of "Henry V," contending that in the Quarto the night-scene of III. vii. was meant to be moved forward to IV. ii., and made consistent with 'the sun is high" tag to IV. ii. Mr. Spedding also urged that certain Quarto corrections of the historical mistakes in the Folio were due to the licenser of the version from which the Quarto was abridged. He also justified, as a dramatic improvement, Shakspere's unhistorical change of making the Dauphin present at the battle.

PHYSICAL SOCIETY.

Nov. 13.—Prof. W. G. Adams, President, in the chair.—Mr. Bosanquet read a paper "On the Nature of the Sounds occuring in the Beats of Consonances," and gave the mathematical theory of the curves drawn by the harmonograph.—Mr. J. M. Grey read a long paper "On the Mechanical Nature of the Forces called Attractions," and explained them on the hypothesis of a universal ether pressure.—Profs. Ayrton and Perry read a note controverting the chemical theory of "contact" electricity enunciated by Herr Exner. Prof. Minchin showed by experiment the photo-electric current set up by a beam of light falling on a sheet of tinfoil immersed in a solution of acid carbonate of calcium, the system forming a new photo-electric cell.

FOLK-LORE SOCIETY.

Nov. 12.—Mr. H. C. Coote, V.P., in the chair.—The Chairman read a paper "On certain Stories in the 'Thousand and One Nights.'" The tales referred to were "The Two Envious Sisters," "Prince Ahmed and the Fairy Pari Banou," "Aladdin," and "Ali Baba." The originals of these four tales have never been found, but as they unquestionably breathe the genuine Oriental spirit, they cannot be taken to be pure inventions of the French translator M. Galland, brilliant as he was. Mr. Coote held the opinion that they were taken down by Galland from oral recitations in Constantinople and Smyrna, in both of which cities he long resided. Mr. Coote supportrd his view by showing that identical stories are still orally told in Greece, from which country he believed they found their way long ago into Italy, where they are all favourites among the peasants. "The Two Envious Sisters" has been probably current in Italy before and since Staparola's time, and the original is a well-known Hindoo story.—The Rev. W. S. Lach-Szyrma read a paper "On Folk-lore Traditions of Historical Events." The paper was divided into two portions: 1. English, and especially West of England, traditions of historical events and personages of importance; 2. Slavonic traditions of a similar character. which were compared with the English. Two of the most remarkable personages in Cornish, folk-lore, Job Militon and John Tregeagle were real persons, around whose true history ancient Aryan myths had clustered. The traditions of Vikings, of the Jews in Cornwall, of the Spaniards and the Armada, and of several events in English history, were examined. A great deal more might be done on this subject, not only in England, but on the Continent, where the traditions of the French, the Italian, and especially the Greek peasants, if collected, would form curious fields of study. The conclusions suggested were that—1. These folk-lore traditions mainly refer to a period between the fall of the Western Empire and the First Crusade, the legends of the Cornish saints and the Arthurian myths belonging to an epoch which also is particularly fruitful in Slavonic legendary lore; 2. The true Middle Ages are singuarly poor in existing folk-lore traditions of a secular character; 3. This comparative silence of popuar tradition about the Middle Ages is the more striking when we consider the richness of the Renaissance epoch in Folk tales. The cases of Drake, Militon, and Tregeagle were compared with Faust and Twardowski. Most of these sixteenth or seventeenth century legends gather round stories of magicians. —Among those who took part in the discussion of these papers were Rev. J. Long, Messrs. Vaux, Nutt, Pfoundes, and Gomme.

ARISTOTELIAN SOCIETY.

Nov. 8.—S. H. Hodgson, Esq., President, in the chair.—A paper was read by Mr. W. A. Casson on "Francis Bacon."

GEOGRAPHICAL SOCIETY.

Nov. 22.—Right Hon. Lord Aberdare, President, in the chair.—The following gentlemen were elected Fellows: Lieut.-Gen. Sir M. A. S. Biddulph, Sir T. G. Briggs, Col. J. Morland, Major J. Alleyne, Major C. C. S. Moncrieff, Capt. E. Ball, Lieut. F. T. N. Spratt, Lieut. H. L. Wells. Hon. W. Egerton, Rev. N. A. B. Borton, Rev. J. L. Carrick, Rev. J. C. Lambert, Messrs. J. R. Arthur, H. S. Ashbee, C. P. Austin, S. Brocklehurst, H. J. Buckwell, O. J. Cattley, J. H. Dean, R. W. Dillon, W. H. Heaton, J. H. Heaton, W. Haworth, H. J. Hopkins, W. Jackson, H. Keene, W. Libbey, W. E. MacIvor, A. Marno, J. Meldrum, G Mercer, C. R. Nunn, C. Pfoundes, F. S. Pulling, W. H. Richardson, J. Russell, J. Shearman, S. P. Smith, W. E. Springall, J. Stewart, S. S. Thorburn, H. G. Thornton, and T. Walker.—The paper read was "Temperate South Africa, considered as a Route to the Central Equatorial Region," by the Right Hon. Sir H. Bartle E. Frere, Bart.

GEOLOGICAL SOCIETY.

Nov. 17.—R. Etheridge, Esq., President, in the chair.—Prof. J. H. Tompson was elected a Fellow.—The following communications were read: "On Abnormal Geological Deposits in the Bristol District," by Mr. C. Moore, and "Interglacial Deposits of West Cumberland and North Lancashire," by Mr. J. D. Kendall.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Nov. 17.—Rev. S. M. Mayhew in the chair. —Rev. Prebendary Scarth described an early font, apparently Saxon, in Stanton Church, Gloucester.—Rev. J. A. Lloyd reported the discovery of Saxon carved work during the recent restoration of his church at Broad Hinton, Wilts, and exhibited a full-size drawing.—Mr. L. Brock reported the discovery of a Roman pavement of beautiful design in the Close, Winchester, of which the Rev. C. Collier sent a drawing.—Mr. Walker produced and described the matrix of the old Chapter seal of the church of St. Peter, Wolverhampton, which has replaced an earlier one of silver now lost.—Mr. Lewis described a kitchen-midden at the Roman castle of Pevensey, and exhibited several fragments of very early pottery. He exhibited a rubbing of a Saxon cotton lid found at Bexhill Church, where much Saxon walls ing has been found above the Roman arche-during recent repairs.—Mr. W. Myers produced a vast number of flint implements from Cissbury Camp, and described the circumstances of their discovery upon the surface of the ground, where large quantities may be found.—Mr. C. Brent exhibited a Hebrew phylactery and a remarkable Etruscan puzzle case without any aperture.—The Chairman produced several beautiful specimens of early pottery found in London; also an early Chinese carving in jasper, found in excavations in Bishopsgate.—Mr. T. Morgan read a a paper "On the Results of the recent Congress at Devizes," and reviewed the principal objects inspected, alluding especially to the discussion at the meeting at Stonehenge.—The second paper was by Mr. C. H. Compton, "On the Cradle Tower in the Tower of London," which has recently been opened out and freed from the modern buildings that surrounded it. The roof is beautifully groined, and, as the reader observed, the tower afforded access from the moat to the queen's apartments. The whole has been repaired under direction of Mr. Taylor, of H. M. Office of Works. A large Roman brick from the recently discovered wall was exhibited and described.

NUMISMATIC SOCIETY.

Nov. 18.—J. Evans, Esq., President, in the chair.—Lord E. S. Churchill, Dr. C. R. Stülpnagel, Messrs. L. Blacker, R. Nelson, and J. Toplis were elected Members.—Mr. B. V. Head exhibited, on behalf of Mr. H. Baker, a set of countermarked shillings of the present century, all having the appearance of being designedly stamped, but with what object it was not apparent.—Mr. J. Toplis exhibited a selection from a hoard of silver coins lately found at Nottingham, among which were two double-struck pennies of Henry I., eight of Stephen, struck at Norwich, Nottingham, London, &c., two being countermarked with a cross; one of Matilda similar to Hawkin's Suppl., Pl. IV., No. 634, *rev.*, SVE...ON.OX,; and one of Roger, Earl of Warwick, Hawkin's "Suppl.," Pl. VI., No. 632.—The Baron G. de Worms exhibited a gold pound sovereign of Elizabeth, m.m. woolpack; a crown piece of James VIII., the elder Pretender; and other coins. Mr. T. T. Bent exhibited two coins of the Republic of San Marino, 1869 and 1875; a Danish coin of Waldemar III. der Store; a coin of Frederic di Montifeltro, d. 1842, Duke of Urbino; and a copper coin of Pavia, *obv.*, emperor's head; *rev.*, San Siro, 1863.—The Rev. Canon Pownall exhibited a bronze medal of Charles I., by J. Roettier, *rev.*, VIRTVT . EX . ME . FORTVNAM EX. ALIJS, a hand from out of a cloud holding a martyr's crown; a silver medal of James II. and his Queen by Bower, *rev.*, SEMPER TIBI PENDEAT HAMVS, in exergue NAVFRAGA REPERTA, 1867; and a bronze medallion of Calvin, executed by A. Bovy, chief Medallist of the Swiss Mint, in 1864: *rev.*, ECCLESIAE REFORMATOR . GENEVAE PASTOR ET TVTAMEN . CORPORE FRACTVS . ANIMO POTENS . FIDE VICTOR . IL TEINT FERME COM'E S'ILEVST VEV CELVY QVI EST INVISIBLE.—Mr. A. J. Evans read a paper on some recent discoveries of Illyrian coins, the result of considerable personal researches in North Albania and Southern Dalmatia. From the mountains above Gusinje the writer had obtained a small hoard of Illyrian coins, bebelonging chiefly to the second century B.C., and comprising many types entirely new to numismatists.—The Rev. Canon Pownall read a paper "On the Testoons of Edward VI.," to prove that some among them, of base metal, bearing mint-marks identical with some of Henry VIII.'s coins (indisputably Irish), and being, moreover, identical in date with the fine silver struck for England, are. in fact, the Irish currency of Edward VI., against the badness of which all Ireland was then exclaiming.

LINNEAN SOCIETY.

Nov. 18.—R. M'Lachlan, Esq., in the chair. —Lieut.-Colonel H. Godwin Austin was elected a Fellow.—Dr. G. Dobson exhibited a remarkable parasitic worm from the intestine of *Megaderma frons*, from the Gold Coast. It appears allied to *Pterygodermatitis plagiostoma*, Wedl, from the long-eared hedgehog, though on first hasty examination Dr. Dobson had been disposed to regard it as a new genus, Metabdella. Dr. M'Donald further drew attention to its peculiar anatomical structure and relationships.—Dr. Cobbold agreed to the importance of the observations as verifying previous discoveries, with addition of novel structural details. He considered the worm as identical with the Ophiostomum of Rudolphi and Willemoes Suhm, with Pterygodermatitis of Wedl, and with Rictularia of Froelich, and he regarded it as an aberrant member of the Ophiostomidæ, whereas Wedl thought it came nearest the Cheiracanthidæ. Dr. Cobbold also exhibited specimens of *Distoma crassum*. Previously, in 1875, some had been brought before the Society from a Chinese missionary, who on going back to China with his wife and daughter, was again attacked by the parasite, and they had been obliged to return to England. A paper was read "On a Proliferous Condition of *Verbascum nigrum*,' by the Rev. G. Henslow. The upper part of the plant was very diffuse with leafy axes produced from the centres of the flowers, while the lower part had flowers with very large ovaries adherent within to arrested proliferous branches. These differences may be attributed to the general tendency of the sap to run to the extremities, and thus cause an excess of development above with simultaneous arrested condition below. A paper "On the classification of the Gasteropoda," Part II., was read by Dr. J. D. M'Donald. In this communication the author gave further data in support of his mode of arranging the group dependent on anatomical characters.—"*Novitates Capenses*" was the title of a paper by Messrs. P. MacOwan and H. Bolus, in which, among other novelties described of South African plants, were *Ranunculus Baurii*, *Orthosiphou ambigueos*, and *Herpolirion Capensis*, the last a representative of a form hitherto known only from Australia.—A communication from the Rev. J. M. Berkeley, "On Australian Fungi," Part II., principally received from Baron F. von Mueller, was taken as read.

ZOOLOGICAL SOCIETY.

Nov. 16.—Prof. Huxley, VP., in the chair. —The Secretary read a report on the additions made to the Society's menagerie from June to November.—Mr. W. K. Parker read a paper on the development of the skull in Urodele Batrachians.—Mr. Parker described the skull of the adult gigantic Salamander (*Sieboldia maxima*), the Siren, and the Menopoma, and compared their structure with that of the various stages of the skull of the common newt.—Mr. G. E. Dobson made remarks on the head of a Partridge (*Perdix cinerea*), with an extraordinary prolongation of the intermaxillary bones,—and Mr. W. A. Forbes on the shedding of the horns of a Prong buck (*Antilocapra Americana*), as recently observed in the specimen living in the Society's gardens.—Mr. Sclater exhibited the skin of the Guinea Fowl lately described in the Society's *Proceedings* as *Numida Ellioti*. Further investigation had induced him to believe that this bird was the same as *Numida pucheroni* of Hartlaub, the inaccurate colouring of the head in Mr. Elliot's figure of that species having prevented its identification.—Papers were read: by Mr. G. A. Boulenger, "On the Aalæarctic and Ethiopian Species of Bufo," of which he recognised ten species, four in the Palæarctic, five in the Ethiopian region, and one found in both regions,—from Dr. O'Finsch, "On the Birds of the Island of Ruk, in the Central Carolines," and "On some new or little-known Species of Pigeons from the Caroline Islands,"—from Mr. E. A. Smith, "On the Shells of the Genus Myodora of Gray," from Mr. M. Jacoby, "On a Collection of Phytophagous Coleoptera made by Mr. Buckley at Eastern Ecuador," —and by Messrs. F. D. Godman and O. Salvin, "On some supposed new Species of Butterflies, collected by Mr. A. Goldie in the interior of the district of Port Moresby, New Guinea."

ENTOMOLOGICAL SOCIETY.

Nov. 3.—Sir J. Lubbock, Bart, V.P., in the chair.—Mr. Heyrick and Capt. T. Broun were elected Ordinary Members, and Dr. J. E. Brandt a Foreign member.—Mr. Waterhouse exhibited on behalf of Mr. S. Oliffe, a pair of dwarfed specimens of *Epione vespertaria*, taken at Arundel.—Mr. M'Lachlan exhibited some curious galls on a broad-leafed aucalyptus from Australia, which were stated to be made by a lepidopterous larva. and also mentioned that in a letter received from Mr. Rutherford, dated from Cameroons, West Africa, the writer stated that he had taken *Papilio meroqe* and *Papilio cenea* in copula.—Mr. Trimen doubted that the butterfly referred to by Mr. Rutherford was *P. cenea*, Stoll, which to the best of his knowledge was a form of a female confined to South Africa, and was more probably either Hippocoon, Fab., or one of the other prevalent West African forms.—Prof. Westwood exhibited a globular gall on the surface of a sallow leaf made by a species of Tenthredinidæ, and also a dipterous larva (Syrphus) found closely adhering to the stem of a pelargonium.—Mr. Kirby exhibited a remarkable variety of *Epunda lutulenta*, and also a remarkable form of Apatura, stated to have been taken by Mr. Ralfe in Pinner Wood.—Sir J. Lubbock exhibited some interesting larvæ which Mr. Culvert had forwarded to him from the Troad through Sir J. Hooker. He stated that these larvæ had recently appeared there in great numbers and were likely to prove most useful, as they fed on the eggs of locusts. These larvæ were probably coleopterous, and Sir J. Lubbock suggested that if the species does not exist in Cyprus it might be worth while to introduce it there.—Mr. Trimen exhibited a wingless female specimen of the Hymenoptera which he had strong grounds for believing was the female of the well-known *Dorylus helvolus*, Linn. Mr. Trimen also exhibited six cases fabricated by a South African lepidopterous larva, of which the outer covering consisted of particles of sand and fragments of stone, which gave them a most peculiar aspect, resembling in general appearance a myriapod. —Sir S. Saunders read a paper "On the Habits and Affinities of the Hymenopterous Genus Scleroderma with Descriptions of New Species."—Mr. E. Saunders read a paper entitled "A Synopsis of British Heterogyna and Fossorial Hymenoptera."—Prof. Westwood read a paper containing descriptions of new species of Exotic Diptera, with a supplement containing descriptions of species formerly described by the author in somewhat inaccessible publications.

MICROSCOPICAL SOCIETY.

Nov. 10.—Dr. Beale, President, in the chair. Dr. Carpenter described Wales's working microscope with iris diaphragm, which he highly commended as combining many novel and excellent points for a student's microscope.—Mr. Lettsom described Abbe's stereoscopic ocular, and Dr. Maddox his apparatus for collecting particles from the air.

—Notes were read "On Monobromide of Napthaline," for mounting diatoms to increase their "index of visibility."—"On Ebonite for Microscopical Appliances,"—and "On Aperture exceeding 180° in Air."—Also papers by Mr. Stewart, "On the Echinometridæ," and by Dr. R. Pigott, "On Testing Object Glasses."

METEOROLOGICAL SOCIETY.

Nov. 17.—Mr. G. J. Symons, President, in the chair.—The following gentlemen were elected Fellows: Captain M. Parry, Messrs. G. Corden, E. T. Dowson, F. Hepburn, C. M. Hepworth, J. Mulvany, T. H. G. Newton, E. P. Phillips, and H. L. Roth.—The papers read were: "Table of Relative Humidity," by Mr. E. E. Dymond,—"Rainfall in South Africa," by Mr. J. G. Gamble,—"On the Meteorology of Mackay, Queensland," by Mr. L. Roth,—and "Thermometrical Observations on board Ship," by Capt, W. F. Caborne.

PHILOLOGICAL SOCIETY.

Nov. 19.—A. J. Ellis, Esq., President in the chair.—The discussion on Spelling Reform was continued, and the following additional resolutions passed:—The Society expresses its approbation of the following reforms, and authorises their adoption by any writer in the Society's printed *Transactions* and papers: (*a*) The dropping of final or inflectional silent *e* when the pronunciation will not be affected by it; (*b*) the restoration of the final *t* of the past tense and participle when possible; (*c*) the spelling in the same way (with *e*) of all endings in *ant*, *ent*, *ance*, *enee*; (*d*) a more extended use of *z*, leaving inflectional *s* alone; (*e*) the substitution of *ee* for *ie* and *ei* where these have the sound of long *e*; (*f*) the substitution of simple *e* for *ea* when it has the sound of *e* in *net*; (*g*) the restoration of the historical *u* for *o* and *ou* in all words having the sound of *u* in *cut*; (*h*) the substitution of *f* for *ph* and *gh* when they sound as *f*; (*i*) the omission of silent *b* in *limb*, &c.; (*j*) the omission of unetymological and unphonetic consonants in at least the following words: de*b*t, dou*b*t, su*b*tle; fei*g*n, forei*g*n, sovérei*g*n; g*h*ost, ag*h*ast, burg*h*er, r*h*yme; cou*l*d; recei*p*t; deme*s*ne, i*s*land; s*c*ythe, s*c*ent; t*h*yme; *w*hole. It was also resolved that the retention of distinctive spellings of words having the same sound but different meanings must, for the present, be left to individual opinion.—Special general meetings for continuing and ending the discussion were ordered te be held on November 26th, 1880, and January 28th, 1881.

SOCIETY OF ARTS.

Nov. 17.—F. J. Bramwell, Esq., in the chair.—The opening address was delivered by the Chairman, and the medals and prives awarded during the previous session were presented.

Nov. 22.—The first lecture of a course of Cantor Lectures "On some Points of Contact between the Scientific and Artistic Aspects of Pottery and Porcelain," was given by Professor Church. The lecture, the earlier portion of which was of an introductory character, dealt with bricks, tiles, terra-cotta, and unglazed earthenware in general, and the various chemical and physical properties of the materials used in their manufacture.

Nov. 24.—Sir H. Cole in the chair.—A paper "On the Influence of Barry on English Art" was read by Mr. J. Comyns Carr.

INSTITUTION OF CIVIL ENGINEERS.

Nov. 23—Mr, W. H. Barlow, President, in the chair.—The papers read were: "On the New Zealand Government Railways," by Mr. J. P. Maxwell,—and,—"On the Ceylon Government Railways," by Mr. J. R. Mosse.

CHEMICAL SOCIETY.

Nov. 18.—Professor H. E. Roscoe, President, in the chair.—It was announced that a ballot for the election of Fellows would take place at the next meeting (December 2nd).—The following papers were read: "Notes on the Oxides of Manganese," by Mr. S. Pickering,—"Aluminium Alcohols," by Messrs. J. H. Gladstone and A. Tribe. When aluminium foil and iodine are heated with alcohol, the latter is decomposed, two new organic aluminic compounds being formed, aluminic iodoethylate $(C_2H_5O)_3I_3Al_2$, and aluminic ethylate $Al_2(C_2H_5O)_6$. The authors have applied this reaction to other alcohols, and have thus prepared aluminic methylate, ethylate, propylate (isopropylate could not be obtained), isobutylate, amylate, cetylate, phenylate, cresylate, and thymolate.—Mr. W. H. Perkin then gave an account of the artificial production of indigo by Professor A. Baeyer, and prepared some before the society. The steps in the process are, toluene C_7H_6O, dichloride of benzyl $C_6H_5.CHCl_2$, cinnamic acid $C_9H_8O_2$, orthonitrycinnamic acid $C_9H_7(NO_2)O_2$, orthonitroquibromhyrocinnamic acid $C_9H_7Br_9O_2(NO_2)$; by the action of caustic potash orthonitrophenyl-propiolic acid $C_9H_5(NO_2)O_2$ is formed, which, on reduction, in alkaline solution, with grape sugar, furnishes indigo $C_{16}H_{10}N_2O_2$.—"On the Synthetical Production of New Acids of the Pyruvic Series, by E. Moritz.—"On the old Alum Well at Harrogate," by Mr. R. H. Davis.—"On the Absorption Spectrum of Ozone," by Professor W. N. Hartley.—"On the Probable Absorption of the Sclar Rays by Atmospheric Ozone," by Professor W. N. Hartley. The author has photographed and measured the absorption spectrum of ozone; he suggests that the shortening of the solar spectrum at the violet end is due to the presence of ozone in the atmosphere, also that the blue colour of the sky may be ascribed to the same cause.—"On Peppermint Camphor," by M. Moriya, of Tokio.

ROYAL SOCIETY OF LITERATURE.

Dec. 22.—J. W. Bone, Esq., in the chair.—Mr. W. de Gray Birch read a paper "On the Roll of the Twelfth Century in the Harley Collection at the British Museum known as the "Guthlac Roll," and exhibited a set of autotype photographs of the subjects therein contained. In the course of the paper he showed how the life of St. Guthlac by Felix, in the ninth century, had been taken as the chief material for the vignettes in the roll, with the exception of the concluding picture, which points to Ingulph of Crowland as the authority for its details. Mr. Birch also demonstrated the great probability of the roll having supplied subjects for painted glass in Crowland Abbey Church.

ANTHROPOLOGICAL INSTITUTE.

Dec. 14.—E. B. Tylor, Esq., President, in the chair. The Rev. R. A. Bullen was elected a Member. Mr. W. St. Chad Boscawen read a paper on "Hittite Civilization."

MINERALOGICAL SOCIETY.

Dec. 23—Prof. M. F. Heddle, President, in the chair. Prof. F. J. Wilk, of Helsingfors, was elected a Corresponding Member; and Messrs, Baxter, Gray, J. Cunningham, R. S. Simpson, H. B. Guppy, and S. Vivian as Ordinary Members. The following papers were read and discussed: "On Tyrceite" and "On Minerals new to Britain," by the President. "Note on Gilbertite and on Tin Pseudomorphs from Belowda Mine," by Mr. J. H. Collins. "On Brochantite and its Allies," by Mr. W. Lemmon. "On a remarkably fine Crystal of Euclase," by Mr. L. Guyot. "On the Action of Organic Acids on Minerals," by Prof. H. C. Bolton, and "Note on Artificial Gay-Lussite," by Mr. C. Rammelsberg.

THE DIFFERENT MODES OF ERECTING IRON BRIDGES.

At the Meeting of the Institution of Civil Engineers on December 7th, a Paper was read on the above subject by Mr. Theophilus Seyrig, M. Inst. C.E., of Paris.

The various modes were arranged by the Author in four classes:—I. Erection upon staging; II. Erection by lifting bodily; III. Erection by rolling-over; IV. Erection by building-out.

I. In erection upon staging, the timber piles or standards were either spaced in rows at equal distances apart, or clustered together, leaving wider spaces between the clusters. The use of standards equally spaced was illustrated by descriptions of the timber stagings employed in the erection of the railway bridges over the Theiss, at Allgyo in Hungary, with 328 feet span; over the the Erdre, at Nantes in Brittany, with 321 feet span; and over the Thaya, at Znaim in Moravia. As examples of clustered standards, the timber stagings were described of the Pont du Carrousel, Paris, with 157 feet spans; Bordeaux Bridge, with 253 feet spans; the railway bridge over the Lek, at Kuilenburg in Holland, with 492 feet span; and Bommel bridge over the Waal, with 393 feet spans. A light iron platform suspended from chains was employed for erecting El Kantara bridge in Algeria, at a height of 393 feet, with 184 feet span. Light iron lattice girders, supported on clusters of timber piles, were used for erecting the railway bridge over the river Inn, at Konigswart in Bavaria, with three spans of 227 feet; but the intermediate piles in the middle span having been swept away by a flood, a temporary wrought-iron framework, stretching across the entire opening, was erected by overhang, its panels advancing from the piers at each side, and meeting midway. Erection upon staging involved the cost of a temporary structure, the whole of which had to be removed after the completion of the permanent work. In many cases this cost was compensated by rapidity, convenience, safety, and cheapness in the erection of the bridge. The danger incurred by staging constructed across rivers liable to floods and drift was exemplified by disasters to the staging at Hamm railway bridge in Renish Prussia, crossing the Rhine with 340 feet spans; by settlement of the staging at Kuilenburg bridge; and by the mishap at Konigswart bridge. Otherwise staging afforded safety and facility for erecting the permanent work, which latter was subjected to no undue strain prior to its completion. Rapidity of erection upon staging was illustrated by examples of bridges put together on the American system of pin connection, without riveting.

II. Erection by lifting bodily had its origin at the Britannia Bridge in 1848, the four large tubes of 470 feet in length being constructed on shore, and floated upon pontoons into position between the piers. The plan was intimated at the Saltash bridge for the two large spans of 455 feet; and at the raiiway bridge over the Weser, near Bremen, in 1867. The railway bridge at Moerdyk in Holland,, having fourteen openings of 328 feet, had lately been erected in a similar way; by aid of the tide the girders constructed on the bank were floated upon pontoons, first to an intermediate halting place, and thence to the bridge piers. At Niagara bridge, spans 197 and 248 feet were erected upon a floating staging, consisting of a platform carried on pontoons. Erection by lifting bodily admitted of large girders being constructed conveniently and in a safe situation, whence they were afterwards floated in a few hours to their intended position; the difficulties were thus concentrated at the fewest points, and the danger was limited within the shortest time. It required, however, the employment of a special gang of bargemen; and involved a considerable outlay for pontoons and tugs, which on a very large work was more than recouped, but not on a small number of spans or light girders.

III. Erection by rolling-over is applied to continuous girders expanding over two or more spans. It involved the principle of planning the work with regard not only to its final purpose, but also to the means whereby it was to be carried out. The facility of erection by rolling-over led to its original adoption at the Sarine railway viaduct at Freiburg in Switzerland, where the roadway was construced on the hill, behind one of the abutments, and then by means of windlasses was pushed bodily forward upon rollers across the successive openings of 160 feet between the piers. A similar method was carried out for the Stadlau bridge at Vienna, crossing 232 feet spans. At Waldshut bridge over the Rhine in Switzerland the windlasses were replaced by ratchet-wheels keyed on the roller spindles, and worked by levers, whereby the rollers were transformed into driving rollers, and the use of hauling ropes were dispensed with. Erection by rolling-over presented the advantages that the main work of constructing the bridge was carried on in safety and convenience upon the bank, the actual rolling was attended with but little expense, and the plant used could be again employed. It was limited, however, to continous girder bridges; the bottom booms of the girders must be of T section; and the lattice sides must be strong enough to withstand considerable compression, and prevent the bottom booms from bending dangerously. The bottom booms were strained by repeatedly passing over the rollers, with changing direction of the strains: and the joints of the lattice bars were liable to be injured thereby. For the replacing of existing bridges by new work in a very speedy way, the new roadway had been erected alongside the old one, and had then been rolled into its place sideways. On railways in Hungary and Austria a number of timber spans, varying from 26 to 210 feet, had thus been successfully replaced. A description was given of the operations of Hernad bridge on the Oderberg and Kaschau line, where two 82 feet spans were thus renewed with only four hours interruption of traffic. In the renewal of one of the Prater bridges on the Austrian State Railway near Vienna, the new bridge of 350 tons weight, constructed of bowstring girders of 200 feet span, and carrying two lines of way, was rolled into position upon a live set of old cannon balls, instead of upon rollers; the same device had previously been used in renewing a single-line bridge over the Waag, at Tornocz. Rolling had also been applied to the temporary timber staging employed for the erection of the permanent structure. This method was illustrated by the successful erection of Saint Just road bridge over the Ardeche, in France, with 152 feet clear openings spanned by arched wrought-iron ribs. Another example was Regoa bridge over the Douro, in Portugal, with spans of 162 and 263 feet; here the rolling timber stage got so strained in the earlier operations as to require the support of intermediate timber piers in crossing the later spans.

IV. Erection by building out, in which the permanent structure was made use of for its erection, dispensed altogether with extraneous appliances, these having been successively less and less depended upon in the modes of erection previously described; lifting bodily required less plant than staging, and building-out still less. El Cinca bridge in Spain, the first erected by building-out, had an arch of 230 feet span, each half of which was erected as a cantilever or wall-bracket projecting from the abutments until their ends meet midway. At the steel bridge over the Mississippi at St. Louis, with two side arches of 502 feet span and a central one of 520 feet, the half arches were erected from the masonry piers, proceeding on both sides of the pier simultaneously, so that the lateral strains should counterbalance one another. The most recent example of erection by building-out was the railway bride crossing the Douro, near Oporto, with a crescent-shaped arch of 525 feet span, the height of the extrados at the crown being 200 feet above the water. The abutments and the iron piers on each bank having been first erected, and the continuous roadway girders having been pushed across them far enough to overhang the arch 105 feet at each side, the arch itself was then erected panel by panel from the springing, the overhanging panels being successfully supported by wire ropes tying their outer extremities to the horizontal girder overhead, where it rested on the pier. The principal details connected with the erection of this bridge were described at length, as an example of work carried on to a completely successful issue under conditions ensuring great safety. Exceptional cases apart, iron bridges of all kinds, from arched bridges to lattice swing bridges, admitted of being erected without the use of auxiliary girders or staging; and under good management it seemed likely that such independent modes of erection would most frequently prove economical.

The Paper was illustrated by a series of diagrams in which red colour was used to distinguish the temporary staging or other extraneous appliances for the erection of the permanent work, while the permanent stru c ture itself was coloured blue.

EDWARDS' IMPROVEMENTS IN DRIVING SEWING MACHINES.

THIS invention consists in improved arrangements applicable for driving sewing machines.

In carrying out my invention I adopt mainly the following arrangements :—

The cloth or other fabric to be sewed being spread out on a table, the end or part to be sewn enters between two rollers, and the machine is then pushed along slowly in the direction it is required to sew.

A disk or roller (covered with indiarubber) about 2 inches in diameter, and 2 inches long, is revolved by the friction of pushing the machine along, and pressing it down on a table or bench.

A toothed wheel of, say, half the diameter carried on the same axle and close to the roller.

The above-mentioned wheel gears with another of about $\frac{3}{4}$ inch in diameter, having a roller on the same axle of, say, twice its diameter, and about 2 inches long. This roller being set as low in the fittings as possible, but so as to be clear of the table. The object of this second roller being to reverse the motion of the first, and pass the cloth over it and under a roller heid thereto by a spring from an arm above.

Another wheel on the same axle as the first-mentioned roller, with diameter, say, of 2 inches, gears with a small wheel (of 1 inch circumference) above it.

This small wheel is fitted on an axle about 6 inches long, and at the other end carries a wheel of about twelve times the circumference of the smaller one, to increase the speed.

This largest wheel gears with a small one behind it, set rather lower than in a line with the centre: the circumference of this small wheel to be also about 1 inch, and on its axle are eccentrics and cams, &c., for producing the motion of the needle and shuttle or rotating hook.

A wheel is placed on the shaft, on which are the eccentrics and cams, gearing with another wheel of the same diameter, and having an axle extending to abreast of the needle, having situate there an arm revolving and striking the under side of the cloth, so as to move it on when the needle is raised. Another roller might be held here from the arm above if necessary. These last-mentioned wheels should be of the same diameter, and such as to put the arm clear of the shuttle or rotating hook, and should be behind the needle.

The cloth would be gathered up in a small double when the needle would be in the cloth, but would be straightened out by the arm when raised.

Various means of producing the motion of needle and shuttle, or hook, or looper can be employed, and arrangements for change of stitch could be made by introducing larger or smaller wheels on the one gearing on the top of the one to the left of the first roller.

If the machine should slide along the table and not drive the wheels, and so forth, the friction could be increased by laying down an indiarubber pad about a foot wide and, say 5 or 6 feet in length, and pushing the machine along on the top of it. Two or three castors would have to be placed about the foot, to prevent it catching too much on the table; also volute spring to regulate the tension might be used.

MACHINEBY FOR STEEL-MAKING BY THE BESSEMER AND THE SIEMENS PROCESS.

AT a recent meeting of the Institution of Civil Engineers, a paper on the above subject was read by Mr· Benjamin Walker, M. Inst. C.E., who stated that much had been done to render easy the manipulation of stall in the molten state, as well as in the solid but heated state. Hydraulic machinery played an important part in this operation. So extensive was the use of water pressure and so gigantic were the machines worked by this power, that it had become indispensable that the water employed as the source of pressure should be economical. To attain the former condition the boilers must be of first-class material and workmanship, and worked at pressures of 80 lbs. to 90 lbs. per square inch. The most advantageous hydraulic pressure was from 600 lbs. to 750 lbs. per inch, and the engines for pressing the water should be of the compound type, highly expansive, and fitted with surface condensers. Large accumulators were necessary, and where the distances were considerable there should be several accumulators. The engines should be kept going continuously. The working was more economical at a piston speed of from 150 to 180 feet per minute than at a lower speed. The valves and ways, especially for the inlet, should be large, the valves having but little lift. Cup-leathers and packing not easily accessible should be avoided, plain rams being preferable to buckets.

The engines for pumping at high pressures should be compound, because the expansion was, to a great extent, beyond the control of the workman; simple piston or slide-valves could be employed, and elaborate gear avoided; the cooling effect was less in the compound than in the simple engine, and the compound engine had proved the more economical.

The author then described a pair of compound pumping engines of 300 indicated H.P. at the pumps. The high-pressure cylinder was 30 inches in diameter, the low-pressure cylinder 50 inches, the stroke of each being 30 inches. To the piston-rod of each cylinder was coupled a double-acting pump, the larger ram of which was 9 inches in diameter, and the smaller $6\frac{1}{8}$ inches. The action of the pump was similar to the ram-and-bucket pump, but ordinary packing was available. The engines were fitted with a surface condenser, air-circulating and boiling pumps. The circulating pump drove water through the condenser tubes to the overhead tank for the supply of the force pumps. The circular slide-bar has been adopted, as it combines lightness with strength and cheapness. The cylinders were steam-jacket, and the valves and pistons were similar to those of a first-class marine engine. Provision was made for rendering the engines automatic by letting boiler-steam at a reduced pressure into the low-pressure cylinder, and by an arrangement in connection with the accumulator, shutting this off when the engines had been set in motion. For the East and West India Docks Company two pairs of compound surface-condensing pumping engines for acumulator pressure of 150 indicated HP. at the pumps recently have been made. The boilers are of the Lancashire type, capable of being worked at a pressure of 75 lbs. per square inch. The engines had two high-pressure cylinders, each 20½ inches in diameter, and two low-pressure cylinders, each 32 inches in diameter, cast together and mounted on one bed plate, but independent. They were fitted for surface condensation. The mean result of a large number of diagrams showed a consumption of coal of 2½ lbs. per indicated HP. per hour. The large amount of water formerly necessary to feed the boilers was not almost entirely dispensed with: only the small quantity required to make up for loss at the head-box and gland of the boiler pump having to be supplied. The high-pressure engines in the same house had to be made surface-condensing by a separate engine; only one-third of the boiler power formerly needed was now required, and only one-third of the coal. The author had collected a large number of indicator diagrams from non-densing pumping engines working accumulators, and found that the average amount of water evaporated per indicated H.P. per hour was 35 lbs.; whereas in the compound highly-expansive surface-condensing pumping engines only 12 lbs. per indicated HP. per hour of water were required to be evaporated.

The cost of producing 1,000 cubic feet of water at a pressure of 700 lbs. per square inch, in the case of the usual plant at Leeds, was for the ordinary high-pressure, non-condensing, non-expansive accumulator pumping engine, about 6s. 7., and for the economical, highly-expansive, surface-condensing engine 4s. 3d.

An economical hydraulic engine was then described, for hauling heavy weights at the author's works at Leeds, in which two small rams, half the area of the larger one, were always in communication with the accumulator, the larger being brought into communication with it alternately by a slide valve. The cranks being at right angles, and a hydraulic valve requiring neither lap nor lead, the crosshead of one ram was arranged to move the valve of the other. The author had made a large number of capstan engines with three cylinders, and had come to the conclusion that the double-acting engine, with cranks at right angles, had many advantages over the three-cylinder engine. It occupied little room, the connecting rods were long, the rams well guided, the valves and gear simple, and the whole was readily accessible, not requiring a foundation when used as a capstain for hauling. As a double-power engine, to exert a strain of 5 tons at 70 feet per minute, the author had employed instead of a double crank a three-throw with six rams, three and three, and with forked connecting rods. The valve for admitting the water had double ports, and the arrangement was such that could be admitted to either three or six rams. Engines of this class were in operation for hauling ships at the eastern extension at the East and West India Docks.

Illustrations were then given of an ingot crane, very economical in the consumption of water; of an 8-ton ingot crane in operation at Messrs. Bolckow, Vaughan, and Co's new steel works at Eston; of a Siemen's steel furnace, with the necessary hydraulic cranes, as in operation at the works of Messrs. John Brown and Company (Limited), Sheffield, and at the West Cumberland Iron and Steel Company's works at Workington; of a ten-ton Bessemer converter; of a centre crane; and finally, of a pair of vertical compound blowing engines, to be used in the process of making Bessemer steel.

SPAGNOLETTI'S IMPROVEMENTS IN RAILWAY SIGNALLING.

This invention has for its object improvements in controlling and working trains on railways by locking signals and interlocking them with the block telegraph system by electrical and mechanical means, and the trains in their course can be made to complete the system.

For this purpose there is attached to the signal frame a small wheel with two slots in it, or a catch lock working in the lever lock, which catch can be duplicated to lock the lever also. Attached to this is a balance weight, and on the lever frame is a spring and stop piece acted on by movement of the lever for relocking it. A coloured disc indicator is attached to the frame to show when the lock is "on" or "off," and also a handle for unlocking the signal lock if required. By these arrangments the knuckle lock of the signal lever, or the lever itself, can be either kept locked or be released at the pleasure of the signalman at the station in advance. Electro magnets are employed, and so arranged as to act upon a small lever bar, and in the wheel system one end of this drops into one of the slots of the wheel, and when in this position the lever cannot be moved to lower the signal. When the bar is out of the slot (which is effected by an electric current), the lever can be moved, the signal lowered, and again be restored to its position of "danger only," and is then again locked. The lever bar which locks and unlocks the wheel acts by a catch or a spring, and when acted upon by the current is held by a catch which is released by the movement of the lever. An electro magnet is inserted in the circuit with the line wire when a polarised or soft iron armature is required, and when the current is sent to release the signal the line wire is broken down, and no second current can be sent to allow a following train to proceed until the previous one has arrived and reset the apparatus to complete the line wire, or until the lever allowing the train to enter the next section has been lowered and put to "danger" again. This apparatus can be worked either mechanically or electrically by the train or lever. If electrically, a releasing relay is used with two sets of electro magnets, one to draw an armature which is caught with a catch, and the other to release the catch holding the armature. If one line wire is employed, a polarised relay is used. A small lever is attached to the relay for unlocking the signal by hand if required, and also a coloured disc indicator showing when it is locked and unlocked. This is used both for the electric lock and signal. The locking arrangement of the lever may also be made with two horizontal helical springs attached to a sliding bar, and so arranged that when the current is sent to release the signal lever, the spring being released by an electro-magnet, the sliding bar is acted upon by the spring and unlocks the lever, by the movement of which this spring is reset, and on putting the lever into its normal position the second spring locks it, and it can only be released by the signalman at the station in advance. The same apparatus acted upon by the train is used with this arrangement. The signals themselves can also be worked electrically by attachments to the spindle acted on by two or more electro-magnets so arranged that when the station in advance sends a current the signal arm is electrically lowered, and when the train leaves the signalman by an electrical current puts the signal to "danger," or this may be done mechanically. Also this arrangement is employed in locking the lever. Signal indicators are used in conjunction with the signal. The apparatus worked by the train is used with this mode of locking and releasing the signal, and the releasing relay may be applied to other purposes. The apparatus acted upon by the train can be placed in any position on the line considered most suitable to the traffic requirements, either above or underground; if the latter the apparatus is enclosed in an india-rubber bag or waterproof case, and the same may be arranged to be reset by the inspector or superintendent. This apparatus is an iron or other box containing a multiplying lever, making electrical contact with springs. A friction roller is fixed on a rod, to which a strong spring is attached to keep roller in required position, also a block of vulcanised indiarubber to prevent the dropping of the roller if the spring should break; or two bars of metal are employed, placed on an incline, which bars are protected by a covering, and on the last vehicle a wire brush is placed, which passes over or between or under the metals, so that by the passing of a train contact is made by either apparatus and line wire joined up again. In cases of slip coaches it is arranged so that on the slipping of one or more coaches the brush of the last vehicle of the train then proceeding is lowered to take the place of the one hitherto used on the slip coach. If from any cause it should be required, arrangements are also made that it shall only be reset by the last vehicle on the train. There are no moveable locks by which the apparatus can in any way be tampered with. In interlocking this apparatus with the block telegraph instruments, the electrical connections are so arranged that the necessary currents for locking and unlocking the signal lever at the station in the rear can be sent from the keys or plungers of the telegraph instruments. To complete this system a "train describer" is used, so that the signalman or person working the signals may know the character of the approaching train, whether fast or slow, goods or passenger, &c. This instrument has a dial divided into certain divisions, according to number required. A pointer travels round the dial, and can be stopped at or worked to any division required, showing the approaching train. Under each division a figure is placed to show the number of times plunger or handle has to be worked to bring the pointer to the required division. The pointer is acted on and moved by a clock escapement movement worked by electro magnets, so that when a current of electricity is sent the pointer advances a division. A friction roller is used to steady movement of pointer. The current may be sent by depression of keys, plungers, or turning wheel.

Patents.—The applications for letters patent for inventions recorded in the Patent Office during 1880 were more numerous than in any previous year, having reached 5,517. In 1879 the number was 5,338, while in 1878 they amounted to 5,343. With a few slight fluctuations, there has been a steady increase of business since the passing of the Patent Law Amendment Act in 1852, when a very sudden and extensive upward tendency manifested itself. In 1850 the number of patents granted reached 523 only, in 1860 the applications were 3,196, and in 1870 they had increased to 3,405.

Mr. William Wilmington, of Toledo, O., has patented certain improvements in that class of *car wheel chills* which have in the outer portion of the flange face a peripheral receptacle for sand or its equivalent. The invention consists in constructing the chill with this peripheral receptacle, and also with a circular chamber in rear of it having an inlet and outlet for the circulation of superheated steam, the object of which is to retard the cooling of the iron in order to increase the depth of the chill.